SECTION – A

Question numbers 1 to 6 carry 2 marks each.

1. (a) In an AP, if $a = 50$, $d = -4$ and $S_n = 0$, then find the value of n.

    OR

    (b) Find the sum of the first twelve 2-digit multiples of 7, using an AP.

2. A solid metallic sphere of radius 3 cm is melted and recast into the shape of a solid cylinder of radius 2 cm. Find the height of the cylinder.
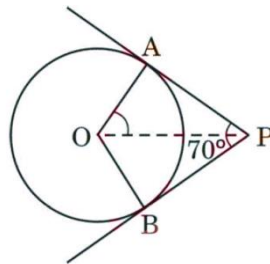
3. (a) Find the nature of the roots of the quadratic equation $x^2 - 5x + 9 = 0$.

4. Find the mode of the following frequency distribution:

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	8	7	12	5	3

5. Solve the quadratic equation $2x^2 - 5x - 1 = 0$ for x.

6. In Figure 1, if tangents PA and PB drawn from a point P to a circle with centre O, are inclined to each other at an angle of $70°$, then find the measure of $\angle POA$.

SECTION – B

Question numbers 7 to 10 carry 3 marks each.

7. The frequency distribution given below shows the weight of 40 students of a class. Find the median weight of the students.

Weight (in kg)	Number of Students
40 – 45	9
45 – 50	5
50 – 55	8
55 – 60	9
60 – 65	6
65 – 70	3

8. (a) Draw a circle of radius 4 cm. Construct a pair of tangents to the circle from a point 6 cm away from its centre.

    (b) Draw a line segment PQ $= 7.5$ cm. Divide it in the ratio 3 : 1.

9. In Figure 2, the angles of elevation of the top of a tower AB of height 'h' m, from two points P and Q at a distance of x m and y m from the base of the tower respectively and in the same straight line with it, are $60°$ and $30°$, respectively. Prove that $h^2 = xy$.
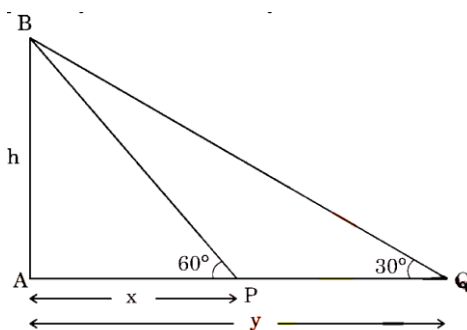

Figure 2

10. The following table shows the age of patients admitted in a hospital during a particular week:

Age (in years)	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
Number of Patients	5	12	20	24	15	4

Find the mean age of the patients.

SECTION – C

Question numbers 11 to 14 carry 4 marks each.

11. (a) A spherical glass vessel has a cylindrical neck 8 cm long and 1 cm in radius. The radius of the spherical part is 9 cm. Find the amount of water (in litres) it can hold, when filled completely.

OR

(b) From a solid cylinder, whose height is 2·4 cm and diameter 1·4 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid.

12. In Figure 3, the tangent *l* is parallel to the tangent m drawn at points A and B respectively to a circle centred at O. PQ is a tangent to the circle at R. Prove that Đ$POQ = 90°$.
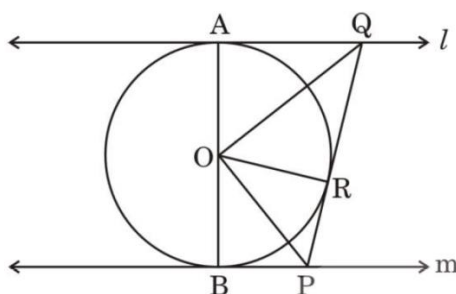
CASE STUDY – 1

13. Do you know old clothes which are thrown as waste not only fill the landfill site but also produce very harmful greenhouse gas. So, it is very important that we reuse old clothes in whatever way we can.

The picture given below on the right, shows a footmat (rug) made out of old t-shirts yarn. Observing the picture, you will notice that a number of stitches in circular rows are making a pattern: 6, 12, 18, 24,...
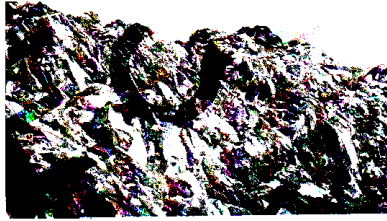
Based on the above information, answer the following questions:

(a) Check whether the given pattern forms an AP. If yes, find the common difference and the next term of the AP.

(b) Write the nth term of the AP. Hence, find the number of stitches in the 10th circular row.

CASE STUDY – 2

14. The following TV Tower was built in 1988 and is located in Pitampura, Delhi. It has an observation deck. Observe the picture given below:

The TV Tower stands vertically on the ground. From a point 'A' on the ground, the angle of elevation of top of the tower (point 'B') is $60°$. There is a point 'C' on the tower which is 78 m (approx) above the ground. The angle of elevation of the point C from point A is found to be $30°$.

(a) Draw a well-labelled figure, based on the information given above.

(b) Find the height of the tower and the distance of the tower from point A.

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